CLAIMS

1. A medical device including circuitry to control delivery of electrical therapy to a patient and a capacitor to store charge for use in the delivery of electrical therapy, comprising:

a first anode mechanically coupled to and electrochemically anodized within a first encasement shell;

a second anode mechanically coupled to and electrochemically anodized within a second encasement shell; and

a cathode disposed between the first anode and the second anode and within the first and second encasement shells.

2. A medical device according to claim 1, the capacitor further comprising separator material sandwiched between the first and second anodes and within the first and second encasement shells to electrically separate the cathode from the anodes.

3. A medical device according to claim 1, the capacitor further comprising:
a first electrical anode pin formed through the first encasement shell for electrical contact with the first anode;

a second electrical anode pin formed through the second encasement shell for electrical contact with the second anode; and

a feedthrough element formed through one of the encasement shells, the feedthrough element including a cathode pin within an insulative material for electrical contact to the cathode.

4. A medical device according to claim 1, wherein the first encasement shell has a greater volumetric dimension than the second encasement shell such that when the cathode is sandwiched between the first and second anodes and within

the first and second encasement shells, the first encasement shell overlaps the second anode to abut against the second encasement shell.

5. A medical device according to claim 1, wherein the first anode and the second anode provides greater structural support to the capacitor than the encasement shells.

6. A medical device according to claim 5, the capacitor further comprising one or more structural enhancing elements within the anodes.

7. A medical device according to claim 1, wherein the encasement shells comprise tantalum and the anodes comprise tantalum powder pressed within the encasement shells and anodized to provide a layer film of tantalum pentoxide on exposed surfaces of said anodes.

8. A medical device according to claim 7, wherein the cathode comprises a titanium substrate coated on opposing sides with hydrous ruthenium oxide.

9. A medical device according to claim 1, wherein the anodes define one or more holes.

10. A medical device according to claim 1, the capacitor further comprising a substantially non-permeable film formed over the capacitor and electrical contacts to the anodes and cathode, wherein the electrical contacts to the anodes and cathode pass through the substantially non-permeable film.

11. A medical device including circuitry to control delivery of electrical therapy to a patient and a capacitor to store charge for use in the delivery of electrical therapy, comprising:

an anode mechanically coupled to and electrochemically anodized within a first encasement shell;

a cathode forming a second encasement shell; and

insulative material disposed at an interface of the first and second encasement shells to electrically isolate the anode from the cathode.

12. A medical device according to claim 11, the capacitor further comprising a separator material sandwiched between the first and second encasement shells to electrically separate the cathode from the anode.

13. A medical device according to claim 11, the capacitor further comprising one or more structural enhancing elements within the anode.

14. A medical device according to claim 11, wherein the first encasement shell comprises tantalum and the anode comprise tantalum powder pressed within the first encasement shell and covered with a film of tantalum pentoxide.

15. A medical device according to claim 14, wherein the second encasement shell comprises a titanium substrate coated on opposing sides of the titanium substrate with hydrous ruthenium oxide.

16. A capacitor, comprising:

a first anode formed within a first encasement shell;

a second anode formed within a second encasement shell; and

a cathode sandwiched between the first and second anodes and within the first and second encasement shells.

17. A capacitor according to claim 16, further comprising separator material sandwiched between the first and second anodes and within the first and second encasement shells to electrically separate the cathode from the anodes.

18. A capacitor according to claim 16, further comprising:
a first electrical anode pin formed through the first encasement shell for electrical contact with the first anode;

a second electrical anode pin formed through the second encasement shell for electrical contact with the second anode; and

a feedthrough element formed through one of the encasement shells, the feedthrough element including a cathode pin within an insulative material for electrical contact to the cathode.

19. A capacitor according to claim 16, wherein the first encasement shell is deeper than the second encasement shell such that when the cathode is sandwiched between the first and second anodes and within the first and second encasement shells, the first encasement shell overlaps the second anode to abut against the second encasement shell.

20. A capacitor according to claim 16, wherein the anodes provide more structural support to the capacitor than the encasement shells.

21. A capacitor according to claim 20, further comprising one or more structural enhancing elements within the anodes.

22. A capacitor according to claim 16, wherein the encasement shells comprise tantalum and the anodes comprise tantalum powder pressed within the encasement shells and formed with a film of tantalum pentoxide on surfaces of the respective anodes.

23. A capacitor according to claim 22, wherein the cathode comprises a titanium substrate coated on opposing sides of the titanium substrate with hydrous ruthenium oxide.

24. A capacitor according to claim 16, further comprising one or more holes formed in the anodes.

25. A capacitor according to claim 16, further comprising a substantially non-permeable film formed over the capacitor, wherein electrical contacts to the anodes and cathode pass through the substantially non-permeable film.

26. A capacitor, comprising:

an anode mechanically coupled to and electrochemically anodized within a first encasement shell;

a cathode forming a second encasement shell; and

insulative material at an interface of the first and second encasement shells to electrically isolate the anode from the cathode.

27. A capacitor according to claim 26, the capacitor further comprising a separator material sandwiched between the first and second encasement shells to electrically separate the cathode from the anode.

28. A capacitor according to claim 26, further comprising one or more structural enhancing elements within the anode.

29. A capacitor according to claim 26, wherein the first encasement shell comprises tantalum and the anode comprise tantalum powder pressed within the first encasement shell and formed with a film of tantalum pentoxide on a surface of the anode.

30. A capacitor according to claim 29, wherein the second encasement shell comprises a titanium substrate coated on opposing sides of the titanium substrate with hydrous ruthenium oxide.

31. A method comprising:

pressing tantalum powder into first and second tantalum corresponding encasement shells to define a first anode slug and a second anode slug;

sintering the first anode slug and the second anode slug at elevated temperature in a pressurized chamber;

immersing the first anode slug and the second anode slug in a formation electrolyte;

applying electrical potential to the immersed first anode slug and the second anode slug until a desired amount of oxide grows on the respective surfaces thereof;

coating a titanium substrate with a cathode active material to form a working cathode;

wrapping the working cathode with at least one layer of a separator material;

sandwiching the cathode between the first and second anodes; and

sealing corresponding edges of the encasement shells.

32. A method according to claim 31, further comprising forming tantalum pentoxide films over the pressed tantalum powder to define anode dielectrics for the first and second anodes.

33. A method according to claim 31, wherein the first and second tantalum encasement shells define cross-sectional depths that are different such that when the cathode is sandwiched between the first and second anodes the first tantalum encasement shell overlaps with the second anode.

34. A method according to claim 31, further comprising forming one of apertures, bores, and ports in the tantalum powder.

35. A method according to claim 31, further comprising sandwiching separator material between the first and second anodes to electrically isolate the cathode from the first and second anodes.

36. A method according to claim 31, further comprising pressing the tantalum powder with one or more structural enhancing elements into the first and second tantalum encasement shells.

37. A method, comprising:

pressing tantalum powder into a tantalum encasement shell to define an anode;

sintering the pressed tantalum powder and the titanium encasement shell at elevated temperature in an pressurized chamber;

anodizing the pressed tantalum powder and the titanium encasement shell in a formation electrolyte to form a layer of tantalum pentoxide over the exposed surfaces of the pressed tantalum powder and the titanium encasement shell to form a working anode slug;

removing at least a majority of ruthenium oxide from the peripheral edge of the encasement shell; and

attaching the peripheral edges of the encasement shell of the working anode slug to a corresponding peripheral edge of a vessel housing a cathode, wherein a layer of electrical insulation is disposed between the respective peripheral edges.

38. A method according to claim 38, further comprising forming tantalum pentoxide films over the pressed tantalum powder to define an anode dielectric for the anode.

39. A method according to claim 38, further comprising pressing holes in the tantalum powder.

40. A method according to claim 31, further comprising sandwiching separator material between the anode and the cathode.

41. A method according to claim 31, further comprising pressing the tantalum powder with one or more structural enhancing elements into the tantalum encasement shell.